

Notes 10/28 - Composition of Functions

→ Putting one function inside another

$$(f \circ g)(x) = f[g(x)]$$

first letter
= outside
function

second letter
= inside
function

→ Plug the whole $g(x)$ function
into $f(x)$ everywhere there's an x

$$(g \circ f)(x) = g[f(x)]$$

→ Plug the whole $f(x)$ function
into $g(x)$ everywhere there's an x

* Use structure of outside function

Ex 1: $f(x) = 5x + 2$ $g(x) = -2x$

$$(f \circ g)(x) = f[g(x)]$$

$$= 5(-2x) + 2 = \boxed{-10x + 2}$$

$$(g \circ f)(x) = g[f(x)]$$

$$= -2(5x + 2) = \boxed{-10x - 4}$$

Ex 2: $f(x) = 2x^2 - x$ $g(x) = 3x + 1$

$$(g \circ f)(x) = 3(2x^2 - x) + 1$$
$$= \boxed{6x^2 - 3x + 1}$$

$$(f \circ g)(x) = 2(3x + 1)^2 - 1(3x + 1)$$
$$= 2(3x + 1)(3x + 1) - 3x - 1$$
$$= 2(9x^2 + 6x + 1) - 3x - 1$$
$$= 18x^2 + 12x + 2 - 3x - 1$$
$$= \boxed{18x^2 + 9x + 1}$$

Do p. 387 # 29, 31, 9